PTO 10-1536

CC=JP
DATE=19940715
KIND=KOKAI
PN=06195056

DISPLAY DEVICE
[HYOJI SOCHI]

HIDEO NAKAMURA, ET AL.

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. JANUARY 2010
TRANSLATED BY: SCHREIBER TRANSLATIONS, INC.

PUBLICATION COUNTRY	(10):	JP
DOCUMENT NUMBER	(11):	064195056
DOCUMENT KIND	(12):	KOKAI
PUBLICATION DATE	(43):	19940715
APPLICATION NUMBER	(21):	1992357754
APPLICATION DATE	(22):	19921225
INTERNATIONAL CLASSIFICATION	(51):	G 09 G 5/14 3/00 5/00
PRIORITY COUNTRY	(33):	N/A
PRIORITY NUMBER	(31):	N/A
PRIORITY DATE	(32):	N/A
INVENTOR(S)	(72):	Hideo Nakamura Yoshihiko Yuyama Hitomi Sahara
APPLICANT(S)	(71):	Sony Corporation
DESIGNATED CONTRACTING STATES	(81):	N/A
TITLE	(54):	Display Device
FOREIGN TITLE	[54A]:	Hyoji Sochi

Specification

[Scope of Patent Claims]

[Claim 1] A display device to be mounted to a mobile body, that is capable of displaying image data from one or more image sources, specifically a display device characterized in that the aspect ratio of its display screen is set to larger than 4:3, and multiple sets of image data are displayed in split areas on the display screen.

[Claim 2] The display system according to Claim 1 characterized in that the display screen size is set to an amount that is within 80 to 100 mm long and within 160 to 180 mm wide.

[Claim 3] The display system according to Claim 1 characterized in that video signals photographed by multiple cameras installed in given locations of an automobile are supplied, and the video signals from the respective cameras can be displayed simultaneously in split areas on the display screen.

[Claim 4] The display system according to Claim 1 characterized in that images showing automobile travel data can be displayed, and when the automobile travel data and other video images are displayed in split areas on the display screen, the display areas can be set so that the

travel data is displayed in a split area closer to the driver on the display screen.

[Detailed Description of the Invention]

[0001]

[Industrial Field of Application] The present invention pertains to a display device, specifically a display device suitable for being mounted to a mobile body such as vehicle, ship, et cetera.

[0002]

[Prior Art] Today, it is widely practiced to mount a display device to a mobile body, such as television receiver to be mounted to automobile. Such display device, in addition to being used as a monitor screen for television receiver, can be used to display operation menus, map data, and GPS data of a navigation system; it can also be used to display controls, operating conditions, equalizer, spectrum analyzer, et cetera of a car audio system such as CD player, cassette deck, et cetera, or monitor character data such as word processor, text broadcasting, et cetera, display automobile travel data (speed, travel distance, direction, fuel gauge, et cetera), and monitor images from monitoring cameras around a vehicle; and by displaying these items, the display device is effective as a display device for vehicles.

[0003]

[Problems to be Solved by the Invention] However, since a typical display device is designed to have the user (driver or passenger) select a desired image from displayable items, the user is often unable to immediately look at the image needed, having to go through a lengthy selection process, or compromising the safety during driving. For example, when the driver, while driving with a map from navigation system displayed, wishes to check equalizing conditions of the car audio system, or to look at a television receiving screen, the selection process is often lengthy, distracting the driver's attention from driving.

[0004] To address this problem, it is known that multiple sets of display items are selected and displayed in split areas on a screen; however, it is difficult to construct an effective screen on a conventional screen featuring an aspect ratio of 4:3, often compromising the visibility of the displayed items.

[0005]

[Means of Solving the Problems] The present invention intends to solve these problems, offering a display device to be mounted to a mobile body that can be used effectively, and contributes to enhancing safety.

[0006] That is, the present invention is a display device

to be mounted to a mobile body, capable of displaying image data from one or more image sources, specifically a display device constructed so that the aspect ratio of its display screen is set to larger than 4:3, and multiple sets of image data are displayed in split areas on the display screen.

[0007] The display system is constructed so that the display screen size is set to within 80 to 100 mm long and within 160 to 180 mm wide so that its external frame can be the 2 DIN size compatible to a typical automobile console for deck, tuner, et cetera.

[0008] The display system is also constructed so that video signals photographed by multiple cameras installed in given locations of an automobile are supplied, and the video signals from the respective cameras can be displayed simultaneously in split areas on the display screen.

[0009] Furthermore, the display system is constructed so that images showing automobile travel data (speed, fuel, tachometer, et cetera) are displayed, and when the automobile travel data and other video images are displayed in split areas on the display screen, the display areas can be set so that the travel data is displayed in a split area closer to the driver on the display screen.

[0010]

[Operation] Since the screen size has an aspect ratio that is larger than 4:3 (for example 16:9), multiple image display on split areas on the screen does not compromise the visibility. This reduces the frequency of image selection operation, enhancing the safety.

[0011]

[Embodiments of the Invention] Embodiments of the present invention will be described below; first, an example of a system configuration of a display system that is capable of displaying multiple images in split areas will be described, followed by other embodiments showing different display applications.

[0012] Fig. 1 is a simplified design of a display system to be mounted to a vehicle. This system is connected to various devices such as automobile audio and visual system, navigation system, vehicle data detection system, et cetera, and is designed to display various image

/2

on its monitor screen.

[0013] 1 is a navigation controller, 2 a GPS (Global Positioning System) receiver, and 3 a CD-ROM player, collectively constructing a navigation system. Navigation controller 1 is designed to identify the current position from the data received at GPS receiver 2, and retrieve from

the CD-ROM player the map data recorded in the CD-ROM, producing a given display output (RGB video signal V_{RGB}) and synchronous signal S_y. It also produces audio data (L, R audio signal A_{LR}) as needed.

[0014] Figure 4 is a tuner to receive TV/AF/FM broadcast, 5 a VTR, and 6 a CD player, collectively constructing an automobile audio and visual system. Tuner 4 and VTR 5 produce composite video signal V_C, while tuner 4, VTR 5, and CD player 5 produce L and R stereo audio signal A_{LR}.

[0015] Figure 7 is a camera system for CCD cameras that are mounted at various locations of the vehicle, and 8 a sensor to detect various vehicle data. Camera system 7 is composed of, for example, 5 CCD cameras; that is, as Fig. 2 shows, CCD cameras 7a, 7b installed near the right and left side mirrors, CCD camera 7c at the rear of the automobile, and CCD cameras 7d, 7e at the left and right front of the automobile. Diagonal lines in the figure represent the direction of area of view of each camera. Also, vehicle data sensor 8 can detect, for example, the driving speed, fuel gauge reading, oil meter, fuel consumption, internal/external temperatures, time, travel time, G meter reading, orientation (north sensor), et cetera.

[0016] Figure 9 is a data process system, including, for example, word processor, personal computer, fax machine, et

cetera These data process systems produce image data V_{RGB} and synchronous signal S_y.

[0017] Composite video signal V_C, after being forwarded from tuner 4 and VTR 5, is selected by video switch 10, supplied to RGG decoder 11, where it is applied Y/C separation for video processing. It is then decoded to R, G, and B signal patterns (V_{RGB}) through matrix processing by R-Y and B-Y signals, and is supplied to video input selector 12. Also, from the output of video switch 10, synchronous signal S_y is extracted by synchronous separation circuit 13, and is supplied to synchronous processor/synchronous converter 14.

[0018] Composite video signal V_C acquired by each of CCD cameras 7a to 7e in camera system 7 is decoded to RGB signal V_{RGB} by RGB decoder 15, and is supplied to video input selector 12. Also, synchronous signal S_y is extracted by synchronous separation circuit 16, and is supplied to synchronous processor/synchronous converter 14. Synchronous processor/synchronous converter 14 produces a synchronous signal for photographing, which is supplied to camera system 7.

[0019] Input selector 12 receives video data from tuner 4 or VTR 5, and camera system 7 as RGB signals V_{RGB}; it also receives video output data from navigation controller 1 and video output data from data process system 9 as RGB signals

V_{RGB}; and out of these data, it selects one or more out of these signals to supply to video converter 17.

[0020] Video converter 17 converts the aspect of each video signal received, splits the screen into areas, and performs pixel compression needed to display these video signals in split areas. To perform these processing tasks, it has memory 18 to temporarily store the video signals received.

[0021] Various detection signals forwarded from vehicle data sensor 8 are encoded into a given code pattern by vehicle data processor 26, and are supplied to system controller 19. System controller 19, composed of a micro computer designed to control various operations of the entire system, sends control signals to required destinations in response to the operation performed by the user through the control program and operation panel 20.

[0022] 21 is a character generator, which sends a given character video signal to video converter 17 according to the command from system controller 19. The output from video converter 17 is supplied to monitor 22, where it is displayed as a video image. Monitor 22 incorporates a brightness enhancing system, for example, Indextron, and its screen features an aspect ratio of 16:9. For example, the screen size is 92 mm long and 152 mm wide, and the monitor is housed in an external frame of a display device

100 mm long and 180 mm wide (that is, 2 DIN size) so that it can be installed in an automobile console.

[0023] Audio signals A_{LR} from tuner 4, VTR 5, CD player 6, and navigation controller 1 are selected by audio switch 23 to be supplied to audio processor 24. At audio processor 24, the signal is equalized, amplified, and further processed as needed, to be supplied to speaker 25 from which it emerges as a stereo audio signal.

[0024] In the system constructed as above, images displayable on monitor 22 include those related to the navigation system (1, 2, 3) such as map data (wide area, enlarged map, map selected by navigation controller 1 such as destination, its vicinity, et cetera), operation menus, meter panels, and GPS data (sky view), those related to the automobile audio visual system (4, 5, 6) such as images received or played, operation menus, and audio data (equalizing, spectrum analysis, volume, et cetera), images photographed by camera system 7, monitor images from data process system 9, and vehicle data (speed, fuel, et cetera)

/3

based on the detection signals from vehicle data sensor 8.

[0025] These video data are supplied as RGB video signals V_{RGB} to image converter 17 through input selector 12, while system controller 19, based on the detected conditions of

the systems (navigation controller 1, automobile audio visual systems 4, 5, 6, audio processor 24, et cetera), or based on the input data from vehicle data processor 26 and operation panel 20, controls character generator 21 to generate given characters to be supplied to image converter 17.

[0026] And, image converter 17 splits the screen into areas and performs pixel compression according to one or more images selected for display by the video data above, and displays an image or multiple images split into multiple areas on monitor 22 using synchronous signals processed into required synchronous status by synchronous processor/synchronous converter 14.

[0027] Using operation panel 20, the user can operate the control navigation system (1, 2, 3) and audio visual system (4, 5, 6), turn on and off camera system 7, specify the number of split areas, positions of areas, and images to display in these areas, switch the areas between left and right, and so forth; and system controller 19 sends control signals to these systems in response to the user's operation, while specifying the process operation for image converter 17, as is described above.

[0028] Embodiments of the image display accomplished by the display system as above will be described below.

[0029] Fig. 3 shows an example wherein a single image is selected and displayed on monitor 22. In Fig. 3 (a), map data supplied by navigation controller 1 is displayed; in Fig. 3 (b), an image of the rear of the automobile photographed by CCD camera 7c of camera system 7 is displayed; in Fig. 3 (c), data from data process system 9, for example, an address book from personal computer, is displayed; in Fig. 3 (d), audio visual data is displayed by system controller 19 based on the operating conditions of CD player 6 and audio processor 18; and in Fig. 3 (e), a G meter is displayed by system controller 19 in response to a signal from vehicle data sensor 8.

[0030] In addition to these conventional displays, the screen can be split into multiple areas to display multiple images as shown in Fig. 4 to Fig. 9 below.

[0031] Fig. 4 is an example wherein the screen is split into 2 areas for display. In Fig. 4 (a), split areas A_1, A_2 are made into large and small screens respectively, and for example, audio visual data is displayed in large area A_1, while orientation data (north sensor) in small area A_2. This arrangement is effective when the user wishes to check the orientation while enjoying the sound from the audio visual system.

[0032] In Fig. 4 (b), small area A_2 is set to have, for

example, an aspect ratio of 4:3, and map data from navigation controller 1 is displayed in large area A_1, while television broadcast (image aspect ratio 4:3) in small area A_2. This arrangement is effective when the user wishes to check the current position with the navigation system while enjoying the television broadcast.

[0033] In Fig. 4 (c), while the size of small area A_2 is arbitrary, large area A_1 displays map data, and small area A_2 displays a GPS sky view that allows the user to monitor GPS reception status of the navigation system, making it possible to simultaneously monitor the map data and GPS reception status. The GPS sky view can be generated by system controller 19, for example, by having the character generator produce a video signal designating the sky view.

[0034] In Fig. 4 (d), split areas A_1, A_2 are nearly equal in size, and television broadcast is displayed in area A_1, while map data in area A_2. This is suitable when the user wishes a larger television video image than that in Fig. 4 (a).

[0035] In Fig. 4 (e) and (f), split areas A_1, A_2 are also nearly equal in size, and such area split is suitable for displaying images around the vehicle that are acquired by camera system 7. In Fig. 4 (e), areas A_1, A_2 on the left and right display images acquired by CCD cameras 7a, 7b

positioned near the left and right side mirrors respectively. Fig. 4 (f) shows images acquired by CCD cameras 7d, 7e positioned in the front of the vehicle on both sides. Simultaneous display of the left and right rear views or the left and right front views can help the user check the surroundings, enhancing driving safety.

[0036] In Fig. 4 (g), area A_1 shows a magnified view of map data, while area A_2 a wide area view of map data, making it easier to look at the map data and to check the current position. Various methods may be used to accomplish such image display; for example, navigation controller 1 can supply 2 different video signals for wide area and magnified views for map display; navigation controller 1 may produce in advance video signals for split areas; or video signals for the wide area map data are temporarily stored in memory at image converter 17, and a site needed is retrieved from the memory data, and processed by pixel compression and interpolation into a magnified view, resulting in a magnified map image of the selected site.

[0037] In Fig. 4 (h), areas A_1, A_2 are positioned vertically, and top area A_1 displays the speed meter and fuel consumption, while bottom area A_2 the fuel, water temperature, oil, vehicle external/internal temperatures, and time.

[0038] Fig. 5 is an example wherein the screen is split into 3. In Fig. 5 (a), area A_1 displays map data, area A_2

/4

a GPS sky view, and area A_3 a menu for navigation system control, significantly improving the effectiveness of the navigation system.

[0039] In Fig. 5 (b), area A_1 displays television broadcast, area A_2 orientation data, and area A_3 travel time and distance data, while in Fig. 5 (c), area A_1 displays television broadcast, area A_2 map data, and area A_3 a television channel. Also, in Fig. 5 (d), area A_1 displays map data, area A_2 television broadcast, and area A_3 fax reception data.

[0040] As these examples show, the user can display 3 desired images in 3 split areas as needed, effectively monitoring items of their choice. Naturally, other items can be selected for display, including the simultaneous display of two TV programs, time and calendar, audio visual operating conditions, vehicle data, et cetera

[0041] Fig. 5 (e) and (f) are examples that are suitable for monitoring images that have been acquired by camera system 7. In Fig. 5 (e), area A_1 displays an image from CCD camera 7b of the left side mirror, area A_2 an image from CCD camera 7a of the right side mirror, and area A_3 an image

from CCD camera 7c at the rear. Also, in Fig. 5 (f), the same images are displayed in a different pattern of screen split, each image reflecting the area of view of each camera. These displays allow the user to monitor the surroundings of the vehicle, enhancing driving safety. Naturally, areas A_1, A_2 can display images from CCD cameras 7e, 7d at the left and right in front.

[0042] Fig. 6 is an example wherein the screen is split into 4; in this case, areas A_1 to A_4 are set to have an aspect ratio of approximately 4:3. Although screen split is not limited to this particular example, having areas featuring an aspect ratio of 4:3 is suitable for display of television broadcast or VTR images.

[0043] In this case, the items below, for example, may be selected for display.

Area A_1 Map data

Area A_2 Television broadcast

Area A_3 Audio visual system operating conditions

Area A_4 Vehicle data

[0044] Area A_1 Television broadcast

Area A_2 Audio visual system operating conditions

Area A_3 Navigation system operation menu

Area A_4 Vehicle data

[0045] In this type of area split, it is effective to

display television broadcast or VTR images, and navigation map data in large area A_1, and supplementary images in smaller areas A_2 to A_4.

[0046] Also, as Fig. 7 shows, when the screen is split into 5 areas A_1 to A_5, images can be assigned to the areas according to the settings specified by the user. It is recommended that the items displayed in large areas A_1, A_2 can be easily switched through left and right area switching operation by operation panel 20.

[0047] Furthermore, as Fig. 8 and Fig. 9 show, the screen may be split into 6 or 9 areas. These arrangements are helpful to display, for example, TV programs per channel in each area when selecting a desired program.

[0048] To accomplish such channel display, system controller 19 controls tuner 4 to support high speed channel selection, while image converter 17 stores input video signals per channel in memory 18. Then, video signals from one channel currently being tuned and video signals from another channel retrieved from memory 18 are combined to acquire split images. As a result, a video image is displayed in one area, and a pseudo video image in another area. It goes without saying that the pseudo video image can be as close to the video image as possible by adjusting the tuning scan speed.

[0049] By the way, when the screen is split unequally at the left and right, as Fig. 6 shows, it is desirable to set the left and right areas to reflect the different types of data the driver and passenger prefer respectively. For example, in a left-hand drive automobile, large area A_1 is positioned on the passenger side to display television broadcast, et cetera, while small areas A_2 to A_4 are positioned on the driver side to display vehicle data, as Fig. 10 (a) shows; in a right-hand drive automobile, the left and right sides are reversed, and small areas A_2 to A_4 are positioned on the driver side to display vehicle data, as Fig. 10 (b) shows. These arrangements are accomplished by left and right area switching operation selected on operation panel 20. Incorporating left and right area switching operation can enhance driving safety. To display map data desired by the driver in large area A_1, the arrangement in Fig. 10 (a) is selected for the right-hand drive automobile, and the arrangement in Fig. 10 (b) for the left-hand drive automobile.

[0050] Simultaneous display of different types of images on split screen areas, as discussed above, helps the driver and passenger grasp the data displayed, and facilitates operation of the navigation system or audio visual system. It also enhances driving safety significantly. Furthermore,

since the screen is elongated horizontally, featuring an aspect ratio of, for example 16:9, images displayed on split areas maintain their visibility, and areas can be split in many different ways. Incidentally, equipment other than those in Fig. 1 can be used as a video signal source, including text broadcast receiver, satellite receiver, et cetera.

[0051] There are other advantages when a display device for mobile body featuring an aspect ratio of 4:3 or larger as in the present invention is used vertically. For example, as Fig. 11 shows, when used to display magnified/wide area

/5

map data, the device makes it possible to view a wider area in the driving direction, effective as an auxiliary display for driving. It is also appropriate for use as a monitor for word processor or fax machine, as Fig. 12 shows. Further, it may be used in boats as a monitor for fish detector, as Fig. 13 shows.

[0052] While the screen was elongated horizontally at 16:9, and the external frame was the 2 DIN size to fit in a typical automobile console in the embodiments, naturally the screen and external frame are not limited to these sizes. It is also possible to construct the entire front panel of the driver seat with a display device according to

the present invention so that vehicle data is constantly displayed while other types of images are displayed in split areas.

[0053]

[Effect of the Invention] As discussed above, a display device according to the present invention, designed to feature an aspect ratio of 4:3 or larger, and to display multiple images in split screen areas, accomplishes split image display featuring excellent visibility, thereby making it possible to simultaneously monitor multiple sets of data. This design also reduces the frequency of image selection operation. Thus, it is effective in significantly enhancing the visibility, safety, and ease of operation, rendering itself particularly suitable for use as a display device for automobiles.

[0054] Furthermore, the device is even more effective in automobiles by complying to the 2 DIN size; it enhances the safety by incorporating split display of images acquired from camera devices positioned around the vehicle, and left and right switching operation of display areas.

[Brief Description of the Drawings]

[Fig. 1] A drawing showing the configuration of an image system using a display device according to the present

invention.

[Fig. 2] A drawing showing the locations of monitor cameras for vehicle surroundings.

[Fig. 3] Drawings of an embodiment showing conventional image displays.

[Fig. 4] Drawings of an embodiment showing 2 split areas for display.

[Fig. 5] Drawings of an embodiment showing 3 split areas for display.

[Fig. 6] Drawings of an embodiment showing 4 split areas for display.

[Fig. 7] Drawings of an embodiment showing 5 split areas for display.

[Fig. 8] Drawings of an embodiment showing 6 split areas for display.

[Fig. 9] Drawings of an embodiment showing 9 split areas for display.

[Fig. 10] Drawings of an embodiment showing left and right switching operation of split areas.

[Fig. 11] A drawing of an embodiment showing a 2 split area display on a vertical screen.

[Fig. 12] A drawing of an embodiment showing a display on a vertical screen.

[Fig. 13] A drawing of an embodiment showing a display on a

vertical screen to be mounted to boat.

[Explanation of the References]

1 Navigation controller

2 GPS

3 CD-ROM

4 Tuner

5 VTR

6 CD player

7 Camera system

7a to 7e CCD camera

8 Vehicle data sensor

9 Data process system

12 Input selector

14 Simultaneous processor/simultaneous converter

17 Image converter

18 Memory

19 System controller

20 Operation panel

21 Character generator

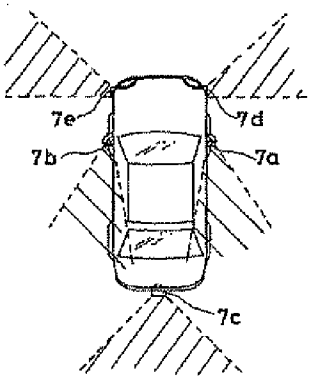
22 Monitor

24 Audio processor

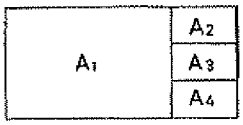
26 Vehicle data processor

[Fig. 2] [Fig. 6] [Fig. 7] [Fig. 8] [Fig. 11]

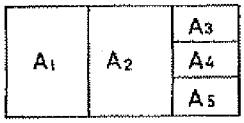
【図2】



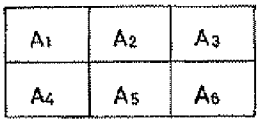
【図6】



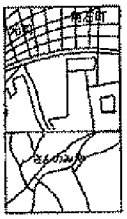
【図7】



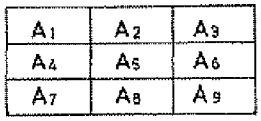
【図8】



【図11】

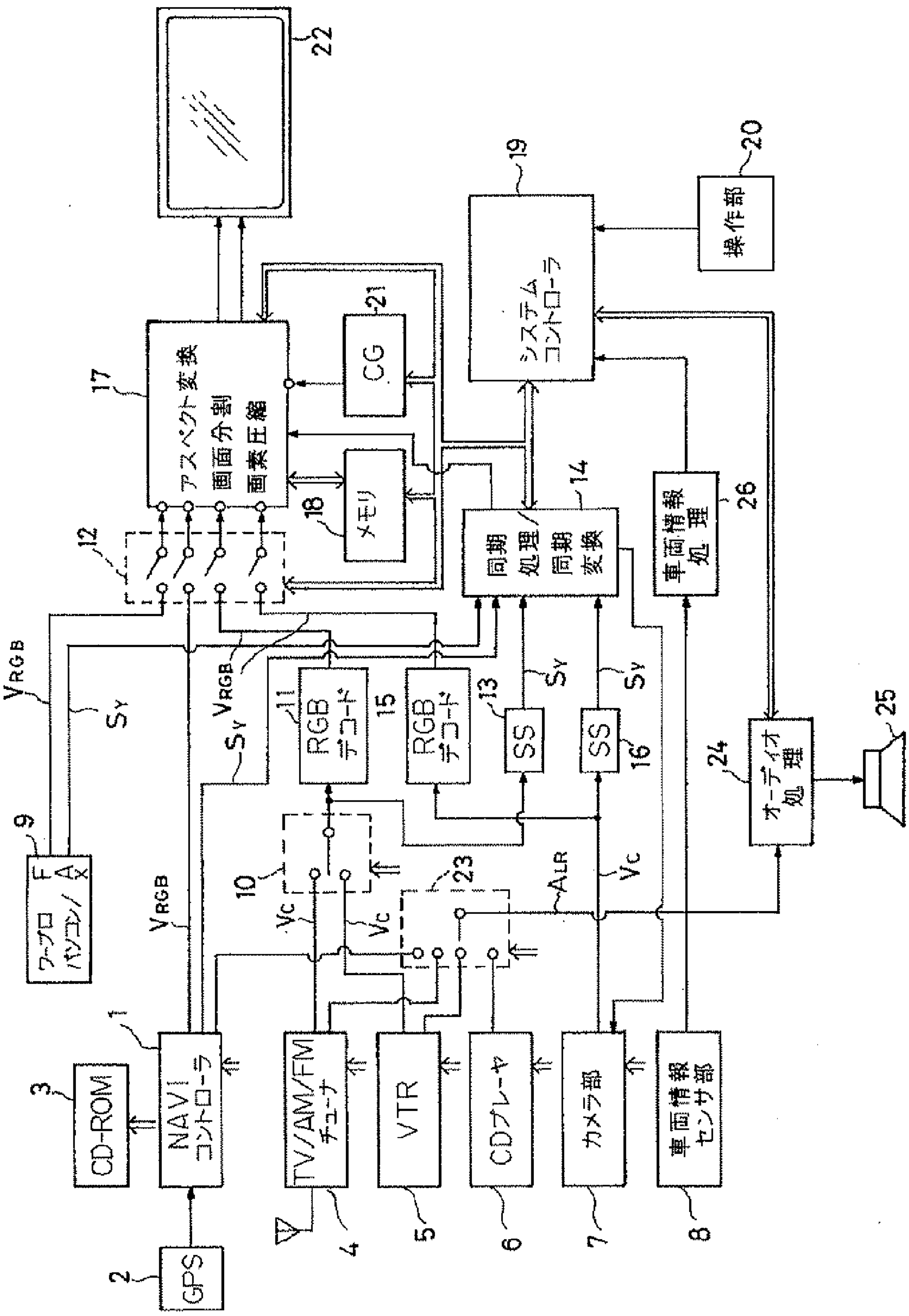


【図9】



[Fig. 9]

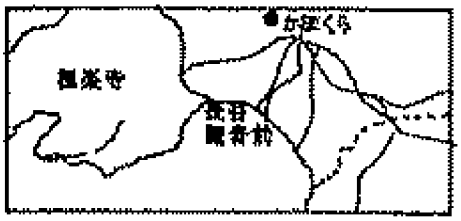
[Fig. 1]



GPS
CD-ROM
NAVI
コントローラ
TV/AM/FM
チューナ
VTR
CDプレーヤ
カメラ部
車両情報
センサ部
ワープロ
パソコン/
FAX
RGB
デコード
SS
同期
処理/
同期
変換
車両情報
処理
オーディオ
処理
メモリ
CG
アスペクト変換
画面分割
画素圧縮
システム
コントローラ
操作部

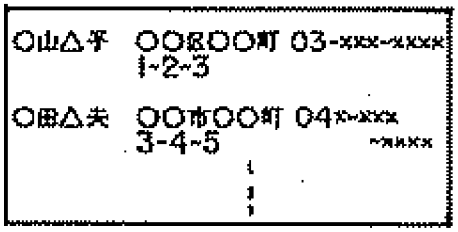
```
9   Word processor, PC, fax machine
11  RGB decoder
15  RGB decoder
17  Aspect conversion
    Screen split
    Pixel compression
```

[Fig. 3]

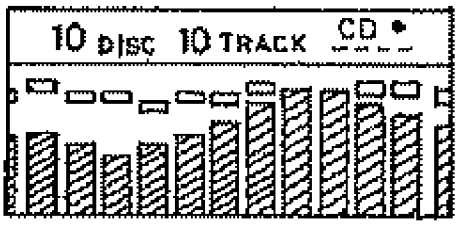


(a)地図情報

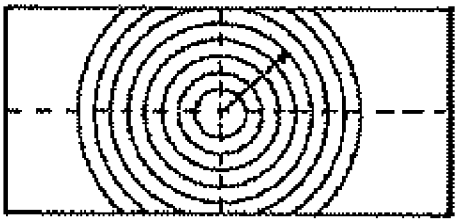
(b)車後方映像



(c)アドレスリスト



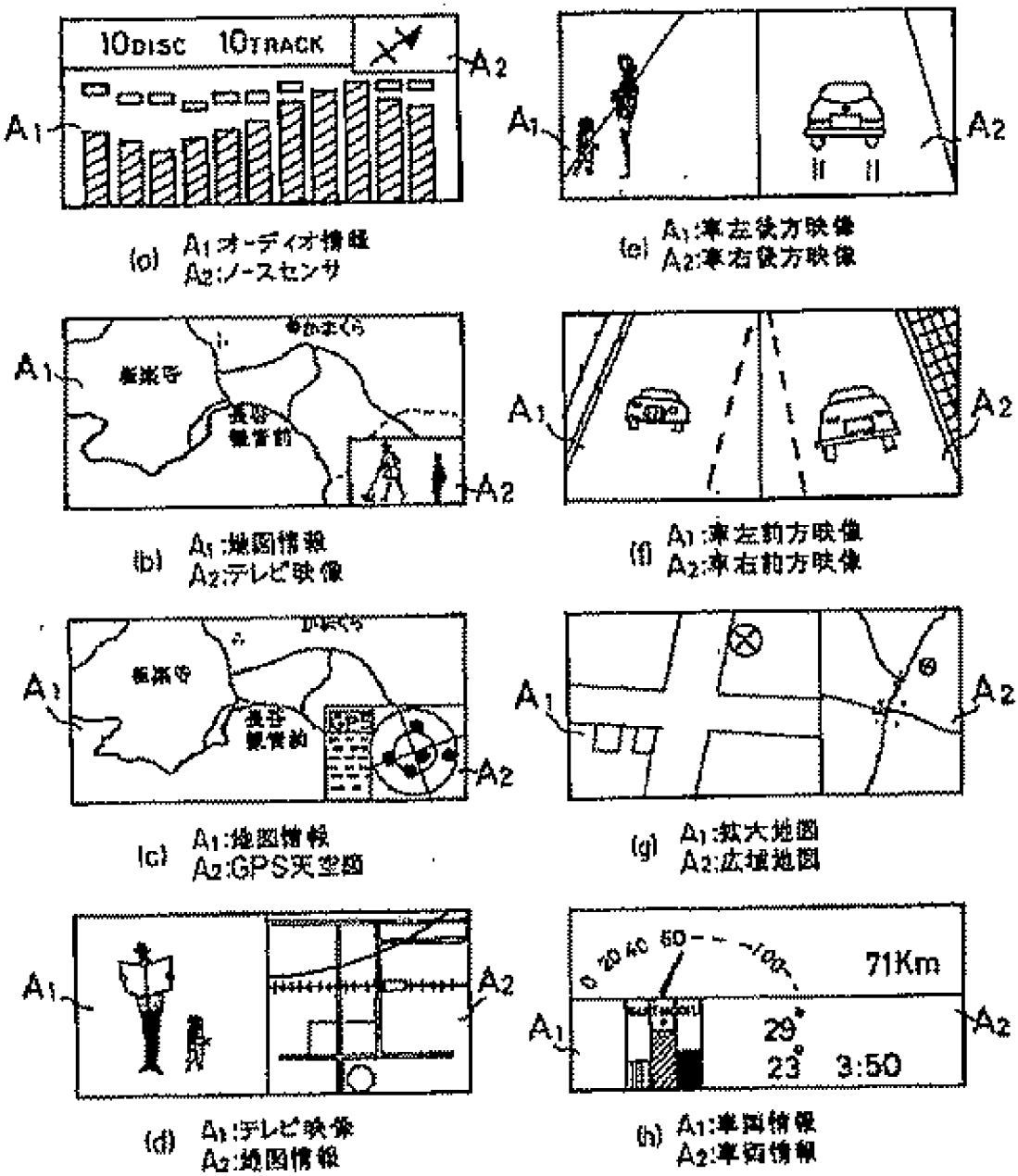
(d)オーディオ情報



(g)Gメーター

(a) Map data
(b) Vehicle rear view
(c) Address book
(d) Audio data
(e) G meter

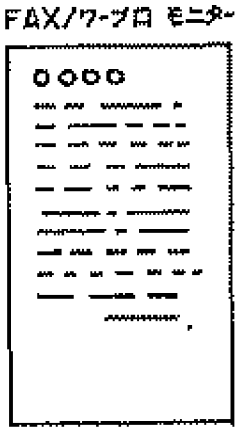
[Fig. 4]



(a) A_1: Audio data
A_2: North sensor
(b) A_1: Map data
A_2: Television broadcast
(c) A_1: Map data
A_2: GPS sky view
(d) A_1: Television broadcast
A_2: Map data
(e) A_1: Vehicle left rear view
A_2: Vehicle right rear view

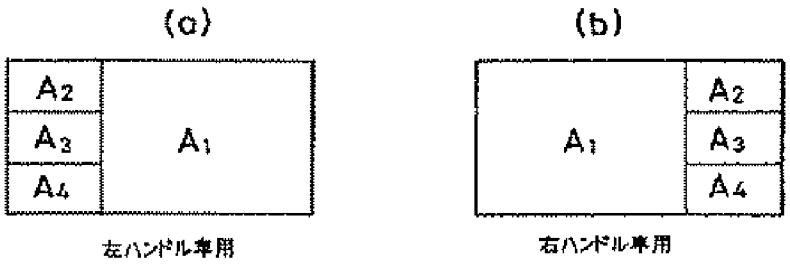
(f) A_1: Vehicle left front view
A_2: Vehicle right front view
(g) A_1: Magnified map
A_2: Wide area map
(h) A_1: Vehicle data
A_2: Vehicle data

[Fig. 12]



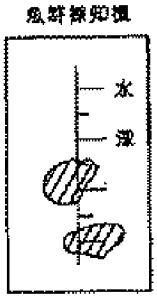
Fax machine/word processor monitor

[Fig. 10]



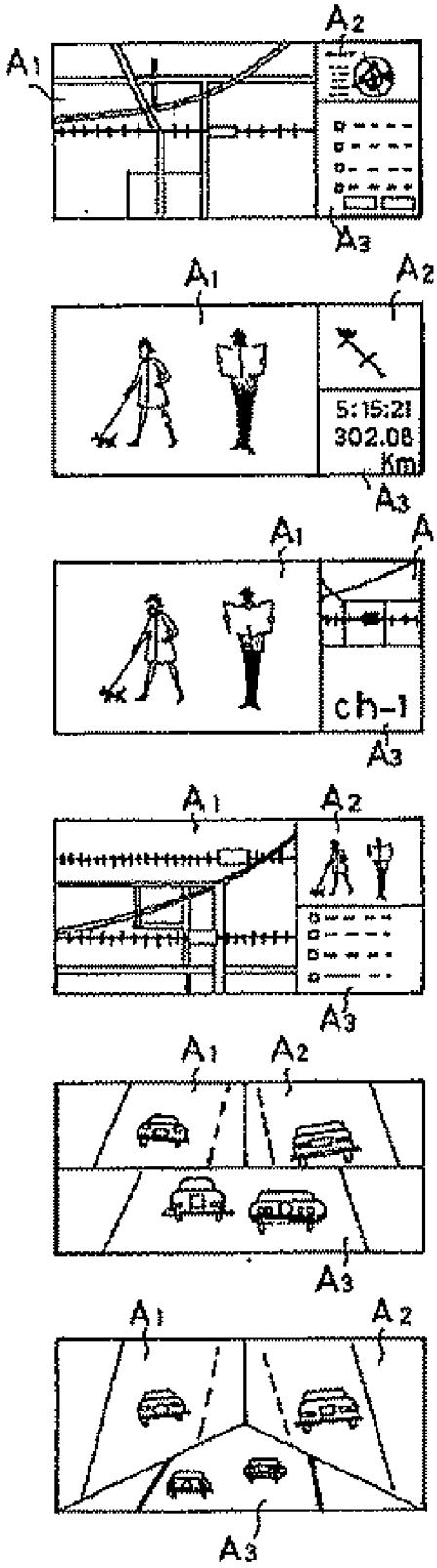
(a) For left-hand drive automobile
(b) For right-hand drive automobile

[Fig. 13]



Fish detector
Water depth

[Fig. 5]



(a) A1:地図情報
A2:GPS天空図
A3:ナビメニュー

(b) A1:テレビ映像
A2:ノースセンサ
A3:車両情報

(c) A1:テレビ映像
A2:地図情報
A3:テレビチャンネル

(d) A1:地図情報
A2:テレビ映像
A3:FAX

(e) A1:車左後方映像
A2:車右後方映像
A3:車後方映像

(f) A1:車左後方映像
A2:車右後方映像
A3:車後方映像

(a) A_1: Map data
A_2: GPS sky view
A_3: Navigation system menu

(b) A_1: Television broadcast
A_2: North sensor
A_3: Vehicle data

(c) A_1: Television broadcast
A_2: Map data
A_3: Television channel

(d) A_1: Map data
A_2: Television broadcast
A_3: Fax

(e) A_1: Vehicle left rear view
A_2: Vehicle right rear view
A_3: Vehicle rear view

(f) A_1: Vehicle left rear view
A_2: Vehicle right rear view
A_3: Vehicle rear view